

Building Site Development
Cass County Area, North Dakota

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. The following tables show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Slight indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. Moderate indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Severe indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Building Site Development--Continued
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Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1: Fargo-----	Severe: ponding cutbanks cave	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: too clayey ponding
Enloe-----	Severe: ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: too clayey ponding
2: Tonka-----	Severe: ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: ponding
3: Parnell-----	Severe: excess humus ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: ponding
4: Perella-----	Severe: ponding	Severe: ponding	Severe: ponding	Severe: ponding	Severe: frost action low strength ponding	Severe: ponding
5: Dovray-----	Severe: ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: too clayey ponding
6: Parnell, PONDED-----	Severe: ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: ponding
9C: Nutley-----	Moderate: too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: too clayey
Fargo-----	Severe: ponding cutbanks cave	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: too clayey ponding
10: Fargo-----	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: too clayey wetness
Ryan-----	Severe: ponding cutbanks cave	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: excess sodium too clayey ponding
11: Nahon-----	Severe: cutbanks cave	Severe: shrink-swell	Moderate: shrink-swell wetness	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: excess sodium
12: Hegne-----	Severe: wetness cutbanks cave	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: too clayey wetness
Enloe-----	Severe: ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: too clayey ponding

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Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
14B: Barnes-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
Buse-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
14C: Barnes-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
Buse-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
14D: Barnes-----	Moderate: slope	Moderate: shrink-swell slope	Moderate: shrink-swell slope	Severe: slope	Severe: low strength	Moderate: slope
Buse-----	Moderate: slope	Moderate: shrink-swell slope	Moderate: shrink-swell slope	Severe: slope	Severe: low strength	Moderate: slope
15: Emrick-----	Slight	Slight	Slight	Slight	Moderate: frost action	Slight
Heimdal-----	Severe: cutbanks cave	Slight	Slight	Slight	Moderate: frost action	Slight
15B: Heimdal-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Moderate: frost action	Slight
Emrick-----	Slight	Slight	Slight	Moderate: slope	Moderate: frost action	Slight
15C: Heimdal-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Moderate: frost action	Slight
Esmond-----	Slight	Slight	Slight	Moderate: slope	Moderate: frost action	Slight
15D: Esmond-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Moderate: slope
Heimdal-----	Severe: cutbanks cave	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Moderate: slope
16B: Barnes-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
Sioux-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Moderate: droughty
16C: Barnes-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
Sioux-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Moderate: droughty
16D: Barnes-----	Moderate: slope	Moderate: shrink-swell slope	Moderate: shrink-swell slope	Severe: slope	Severe: low strength	Moderate: slope

Building Site Development--Continued
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Sioux-----	Severe: cutbanks cave	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope droughty
17B: Barnes-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Slight
Svea-----	Moderate: wetness	Moderate: shrink-swell	Moderate: shrink-swell wetness	Moderate: shrink-swell	Severe: low strength	Slight
18: Bearden-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: shrink-swell wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Moderate: wetness
19: Colvin, SALINE-----	Severe: wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding low strength wetness	Severe: excess salt wetness
20: Bearden, SALINE-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Severe: excess salt
22: Bearden-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: shrink-swell wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Moderate: wetness
Perella-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Slight
23F: Buse-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: slope
Barnes-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: slope
24: Cashel-----	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell	Moderate: flooding wetness
25: Cashel, CHANNELED-----	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell	Severe: flooding
26: Colvin-----	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: frost action low strength wetness	Severe: wetness
27: Divide-----	Severe: wetness cutbanks cave	Moderate: wetness	Severe: wetness	Moderate: wetness	Moderate: frost action wetness	Moderate: wetness
29: Fargo, SALINE-----	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: excess salt wetness

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Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
31B: Embden, GRAVELLY SUBSTRATUM-----	Severe: cutbanks cave	Slight	Moderate: wetness	Slight	Moderate: frost action	Slight
32: Fargo-----	Severe: ponding cutbanks cave	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: too clayey ponding
35: Fairdale-----	Moderate: flooding wetness	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding
36: Fargo-----	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: too clayey wetness
37: Fargo, DEPRESSIONAL-----	Severe: ponding cutbanks cave	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: too clayey ponding
38: Fargo-----	Severe: ponding cutbanks cave	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: flooding shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: ponding
39: Galchutt-----	Severe: wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: frost action low strength shrink-swell	Moderate: wetness
40: Fargo-----	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: too clayey wetness
Hegne-----	Severe: wetness cutbanks cave	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: too clayey wetness
41: Hegne-----	Severe: wetness cutbanks cave	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: wetness
Fargo-----	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: wetness
43: Gardena-----	Moderate: wetness	Slight	Moderate: wetness	Slight	Severe: frost action	Slight
46: Gardena-----	Moderate: wetness	Slight	Moderate: wetness	Slight	Severe: frost action	Slight
Glyndon-----	Severe: cutbanks cave	Slight	Moderate: wetness	Slight	Severe: frost action	Slight

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Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
47: Fargo, SMOOTH SURFACE---	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: too clayey wetness
48: Glyndon-----	Severe: cutbanks cave	Slight	Moderate: wetness	Slight	Severe: frost action	Slight
49: Glyndon, SALINE-----	Severe: wetness cutbanks cave	Moderate: wetness	Severe: wetness	Moderate: wetness	Severe: frost action	Severe: excess salt
50: Hamerly-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell wetness	Severe: frost action	Moderate: wetness
Tonka-----	Severe: ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: ponding
50B: Hamerly-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: frost action	Moderate: wetness
51: Hamerly, SALINE-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Severe: excess salt
54: Lamoure-----	Severe: wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding low strength wetness	Severe: wetness
55: Ladelle-----	Moderate: flooding wetness	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding frost action low strength	Moderate: flooding
57: Channeled-----	---	---	---	---	---	---
Fairdale-----	Moderate: flooding wetness	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
58B: Maddock-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Moderate: droughty
59: Overly-----	Moderate: too clayey wetness	Moderate: shrink-swell	Moderate: shrink-swell wetness	Moderate: shrink-swell	Severe: frost action low strength	Slight
59B: Overly-----	Moderate: too clayey wetness	Moderate: shrink-swell	Moderate: shrink-swell wetness	Moderate: shrink-swell slope	Severe: frost action low strength	Slight
61: Perella-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Slight
Bearden-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: shrink-swell wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Moderate: wetness

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62: Overly-----	Moderate: too clayey wetness	Moderate: shrink-swell	Moderate: shrink-swell wetness	Moderate: shrink-swell	Severe: frost action low strength	Slight
Bearden-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: shrink-swell wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Moderate: wetness
63B: Renshaw-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Moderate: droughty
Sioux-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Moderate: droughty
63C: Sioux-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Severe: droughty
64: Pits, Gravel-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope small stones droughty
65: Svea-----	Moderate: wetness	Moderate: shrink-swell	Moderate: shrink-swell wetness	Moderate: shrink-swell	Severe: low strength	Slight
Barnes-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Slight
66: Wyard-----	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: frost action	Moderate: wetness
Hamerly-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell wetness	Severe: frost action	Moderate: wetness
67: Galchutt-----	Severe: wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: frost action low strength shrink-swell	Moderate: wetness
71: Vallers-----	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: frost action	Moderate: wetness
72: Wahpeton-----	Moderate: flooding too clayey	Severe: flooding shrink-swell	Severe: flooding shrink-swell	Severe: flooding shrink-swell	Severe: flooding low strength shrink-swell	Severe: too clayey
73: Rauville-----	Severe: wetness cutbanks cave	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding low strength wetness	Severe: flooding wetness
76: Wyndmere-----	Severe: wetness cutbanks cave	Moderate: wetness	Severe: wetness	Moderate: wetness	Severe: frost action	Moderate: wetness
76B: Wyndmere-----	Severe: wetness cutbanks cave	Moderate: wetness	Severe: wetness	Moderate: slope wetness	Severe: frost action	Moderate: wetness

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77: Vallers, SALINE-----	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: frost action low strength wetness	Severe: excess salt wetness
78B: Svea-----	Moderate: wetness	Moderate: shrink-swell	Moderate: shrink-swell wetness	Moderate: shrink-swell slope	Severe: low strength	Slight
Buse-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Slight
80: Wyndmere-----	Severe: wetness cutbanks cave	Moderate: wetness	Severe: wetness	Moderate: wetness	Severe: frost action	Moderate: wetness
Tiffany-----	Severe: ponding cutbanks cave	Severe: ponding	Severe: ponding	Severe: ponding	Severe: frost action ponding	Severe: ponding
82: Glyndon-----	Severe: cutbanks cave	Slight	Moderate: wetness	Slight	Severe: frost action	Slight
Tiffany-----	Severe: ponding cutbanks cave	Severe: ponding	Severe: ponding	Severe: ponding	Severe: frost action ponding	Severe: ponding
83: Galchutt-----	Severe: wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: frost action low strength shrink-swell	Moderate: wetness
Fargo-----	Severe: ponding cutbanks cave	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: ponding
84: Bearden-----	Severe: wetness	Moderate: shrink-swell wetness	Severe: shrink-swell wetness	Moderate: shrink-swell wetness	Severe: frost action low strength	Moderate: wetness
Lindaas-----	Severe: ponding	Severe: shrink-swell ponding	Severe: ponding	Severe: shrink-swell ponding	Severe: low strength shrink-swell ponding	Severe: ponding
85: Fairdale, VARIANT-----	Severe: wetness	Severe: flooding	Severe: flooding shrink-swell wetness	Severe: flooding	Severe: frost action	Slight
86: Dumps-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: slope
Pits-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope small stones droughty
M-W: Miscellaneous Water-----	---	---	---	---	---	---
W: Water-----	---	---	---	---	---	---

